

AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions, and listings, of claims in the application:

1. (Currently amended) A welding machine for welding around a circumference of cylinder members in order to join a first cylinder member and a second cylinder member into which the first cylinder member is inserted by applying welding energy to the cylinder members while relatively rotating the cylinder members with respect to the machine, ~~inserting a first cylinder member into a second cylinder member and for welding the cylinder members together around their circumference,~~ the welding machine comprising:

an energy source for generating energy, the energy being used for melting the cylinder members at a portion to be welded and for welding the cylinder members together; and

energy-applying units for applying the energy to the cylinder members, wherein:

the energy-applying units are disposed outside the cylinder members at two ~~positions;~~ positions, and are directed to the cylinder members to apply the energy to two target points on a circumferential welding path on the cylinder members, two of the target points being angularly apart from each other by an angle of ~~and when an angle, by which the energy applying units are separated from each other around the circumference of the cylinder members, is defined by θ degrees, where $80 \leq \theta \leq 100$, and~~

the welding machine is constructed and arranged so that the energy applying units simultaneously apply the energy to respective target points while relatively rotating the cylinder members more than one revolution with respect to the energy applying units so that the circumferential welding path is traced at least twice by the energy.

2. (Currently amended) A welding machine for welding around a circumference of cylinder members in order to join a first cylinder member and a second cylinder member into which the first cylinder member is inserted by simultaneously applying welding energy to the cylinder members while relatively rotating the cylinder members with respect to the machine, ~~inserting a first cylinder member into a second cylinder member and for welding the cylinder members together around their circumference,~~ the welding machine comprising:

an energy source for generating energy, the energy being used for melting the cylinder members at a portion to be welded and for welding the cylinder members together; and

a plurality of energy-applying units for applying the energy to the cylinder members, wherein:

the number of energy-applying units is three or more;

the energy-applying units are disposed outside the cylinder members at three or more respective positions, and are directed to the cylinder members to apply the energy to "n" target points on a circumferential welding path on the cylinder members, the "n" target points being angularly spaced apart from each other by an angle of; ~~and when a number of the energy-applying units is defined by "n" and an angle, by which the neighboring energy-applying units are separated from each other in a circular direction about the cylinder members, defined by θ degrees, where $[(360/n) - 10] \leq \theta \leq [(360/n) + 10]$, and~~

the welding machine is constructed and arranged so that the energy applying units simultaneously apply the energy to respective target points while relatively rotating the cylinder members more than one revolution with respect to the energy applying units so that the circumferential welding path is traced at least "n" times by the energy.

3. (Original) The welding machine according to claim 1, wherein:
the energy-applying units are disposed on a plane perpendicular to a center axis of the cylinder members; and
the energy is introduced from the energy-applying units to the cylinder members along the plane.

Claims 4-6. (Canceled).

7. (Currently amended) The welding machine according to claim 1, wherein the welding machine is constructed and arranged to join cylinder members of for an injector, the injector comprising:

- a valve body including a valve seat;
- a valve member for stopping fuel injection when seated on the valve seat, and for permitting fuel injection when separated from the valve seat;
- a movable core connected to the valve member at an opposite side of the valve seat, the movable core reciprocating together with the valve member;
- a fixed core disposed opposite the valve member relative to the movable core, the fixed core facing the movable core;
- an electromagnetic driving device for generating magnetic force by which the movable core is attracted to the fixed core; and
- a housing member of which inner peripheral wall is connected to an outer peripheral wall of the valve body, the housing member containing the movable core so as to reciprocate therein,

~~wherein: each of the housing member and the valve body is a cylinder member; and wherein the welding machine is adapted to join the valve body as a first cylinder member is inserted into the housing member as a second cylinder member,~~ and the valve body and the housing member are welded to each other by melting them about a circumference of the housing member.

8. (Currently amended) The welding machine according to claim 7, wherein:
~~each of the valve member and the movable core is a cylinder member; and~~
the welding machine is adapted to join the valve member as a first cylinder
member ~~is inserted into the movable core as a second cylinder member~~, and the valve
member and the movable core are welded to each other by melting them about the
circumference of the movable core.

9. (Currently amended) The welding machine according to claim 8, wherein:
the injector includes a magnetic member, disposed outside the housing member
and the fixed core, for magnetically connecting the housing member and the fixed core;
~~the magnetic member is a cylinder member; and~~
the welding machine is adapted to join the housing member as a first cylinder
member and ~~is inserted into the magnetic member as a second cylinder member~~, and
the housing member and the magnetic member are welded to each other by melting
them about the circumference of the magnetic member.

10. (Currently amended) The welding machine according to claim 7, wherein:
the injector includes a magnetic member, disposed outside the housing member
and the fixed core, for magnetically connecting the housing member and the fixed core;
~~the magnetic member is a cylinder member; and~~
the welding machine is adapted to join the housing member as a first cylinder
member and ~~is inserted into the magnetic member as a second cylinder member~~, and
the housing member and the magnetic member are welded to each other by melting
them about the circumference of the magnetic member.

Claim 11. (Canceled).

12. (Original) The welding machine according to claim 2, wherein:
the energy-applying units are disposed on a plane perpendicular to a center axis of the cylinder members; and
the energy is introduced from the energy-applying units to the cylinder members along the plane.

13. (Currently amended) The welding machine according to claim 12, wherein the welding machine is conducted and arranged to join two cylinder members of for an injector, the injector comprising:

- a valve body including a valve seat;
- a valve member for stopping fuel injection when seated on the valve seat, and for permitting fuel injection when separated from the valve seat;
- a movable core connected to the valve member at an opposite side of the valve seat, the movable core reciprocating together with the valve member;
- a fixed core disposed opposite the valve member relative to the movable core, the fixed core facing the movable core;
- an electromagnetic driving device for generating magnetic force by which the movable core is attracted to the fixed core; and
- a housing member of which inner peripheral wall is connected to an outer peripheral wall of the valve body, the housing member containing the movable core so as to reciprocate therein,

~~wherein: each of the housing member and the valve body is a cylinder member; and~~ wherein the welding machine is adapted to join the valve body as a first cylinder member is inserted into the housing member as a second cylinder member, and the valve body and the housing member are welded to each other by melting them about a circumference of the housing member.

14. (Currently amended) The welding machine according to claim 2, wherein the welding machine is conducted and arranged to join two cylinder members of for an injector, the injector comprising:

a valve body including a valve seat;

a valve member for stopping fuel injection when seated on the valve seat, and for permitting fuel injection when separated from the valve seat;

a movable core connected to the valve member at an opposite side of the valve seat, the movable core reciprocating together with the valve member;

a fixed core disposed opposite the valve member relative to the movable core, the fixed core facing the movable core;

an electromagnetic driving device for generating magnetic force by which the movable core is attracted to the fixed core; and

a housing member of which inner peripheral wall is connected to an outer peripheral wall of the valve body, the housing member containing the movable core so as to reciprocate therein,

~~wherein: each of the housing member and the valve body is a cylinder member; and~~ wherein the welding machine is adapted to join the valve body as a first cylinder member inserted into the housing member as a second cylinder member, and they are welded to each other by melting them about a circumference of the housing member.

15. (Currently amended) The welding machine according to claim 13, wherein:
~~each of the valve member and the movable core is a cylinder member; and~~
the valve member as the first cylinder member is inserted into the movable core as a second cylinder member, and the valve member and the movable core are welded to each other by melting them about the circumference of the movable core.

16. (Currently amended) The welding machine according to claim 15, wherein:
the injector includes a magnetic member, disposed outside the housing member
and the fixed core, for magnetically connecting the housing member and the fixed core;
~~the magnetic member is a cylinder member; and~~
the housing member as a first cylinder member is inserted into the magnetic
member, and the housing member and the magnetic member are welded to each other
by melting them about the circumference of the magnetic member.

17. (Currently amended) The welding machine according to claim 14, wherein:
~~each of the valve member and the movable core is a cylinder member; and~~
the valve member as a first cylinder member is inserted into the movable core as
a second cylinder member, and the valve member and the movable core are welded to
each other by melting them about the circumference of the movable core.

18. (Currently amended) The welding machine according to claim 13, wherein:
the injector includes a magnetic member, disposed outside the housing member
and the fixed core, for magnetically connecting the housing member and the fixed core;
the magnetic member is ~~a cylinder~~ the second cylinder member; and
the housing member is the first cylinder member and is inserted into the
magnetic member, and the housing member and the magnetic member are welded to
each other by melting them about the circumference of the magnetic member.

19. (Currently amended) The welding machine according to claim 17, wherein:
the injector includes a magnetic member, disposed outside the housing member
and the fixed core, for magnetically connecting the housing member and the fixed core;
~~the magnetic member is a cylinder member; and~~
the housing member as a first cylinder member is inserted into the magnetic
member, and the housing member and the magnetic member are welded to each other
by melting them about the circumference of the magnetic member.

20. (Currently amended) The welding machine according to claim 14, wherein:
the injector includes a magnetic member, disposed outside the housing member
and the fixed core, for magnetically connecting the housing member and the fixed core;
~~the magnetic member is a cylinder member; and~~
the housing member as a first cylinder member is inserted into the magnetic
member, and the housing member and the magnetic member are welded to each other
by melting them about the circumference of the magnetic member.

21. (Currently amended) A welding method for welding cylinder members
together using a welding machine, the welding method comprising ~~the steps of:~~
relatively rotating a first cylinder member and a second cylinder member about a
center axis located inside of the first and second cylinder members with respect to the
welding machine;

providing a first energy applying unit disposed outside of the ~~first cylindrical~~
cylinder member and the second cylindrical cylinder member to apply the energy on a
first target point on a circumferential welding path to join the first cylinder member and
the second cylinder member;

providing a second energy applying unit disposed outside of the ~~first cylindrical~~
cylinder member and the second cylindrical cylinder member to apply the energy on a
second target point on the circumferential welding path to join the first cylinder
member and the second cylinder member, the second target point being angularly
apart from the first target point with respect to a rotating direction of the first cylinder
member and the second cylinder member;

providing an energy source for generating energy for the energy applying units;
applying energy to the first cylindrical member and the second cylindrical
member through the first energy applying unit and the second energy applying unit
simultaneously while the first cylinder member and the second cylinder member are

rotated for more than one revolution with respect to the energy applying units so that the circumferential welding path is traced at least twice by the applied energy;

melting the first cylindrical member and the second cylindrical member a first time with the first energy applying unit or the second energy applying unit as the cylindrical members are rotated; ~~and~~

welding the first cylindrical member and the second cylindrical member a first time with the first energy applying unit or the second energy applying unit as the cylindrical members are rotated;

melting the first cylindrical member and the second cylindrical member a second time with the second energy applying unit or the first energy applying unit as the cylindrical members are rotated; and

welding the first cylindrical member and the second cylindrical member a second time with the second energy applying unit or the first energy applying unit as the cylindrical members are ~~rotated;~~ rotated.

22. (New) The welding method according to claim 21, wherein the first target point and the second target point are angularly apart from each other by an angle of θ degrees, where $80 \leq \theta \leq 100$.

23. (New) The welding method according to claim 21, further comprising at least one additional energy applying unit to provide a total of "n" energy-applying units and "n" target points, wherein the "n" target points are angularly spaced apart from each other by an angle of θ degrees, where $[(360/n)-10] \leq \theta \leq [(360/n) + 10]$.

24. (New) The welding method according to claim 21, wherein the first cylinder member is inserted into the second cylinder member, and the circumferential welding path is placed outside of the second cylinder member within which the first cylinder member is located.

25. (New) The welding method according to claim 24, wherein the welding energy applied by the first energy applying unit and the second energy applying unit is capable of melting the second cylinder member and only an outside portion of the first cylinder member located just inside the second cylinder member.

26. (New) A method for manufacturing an injector, the method comprising:
providing a first cylinder member having a cylinder portion;
providing a second cylinder member having a cylinder portion into which the cylinder portion of the first cylinder member is able to insert;
inserting the first cylinder member into the second cylinder member to make the cylinder portions overlapped in radial direction; and
welding the second cylinder member and the first cylinder member along a circumferential welding path that forms a closed circle around the second cylinder member and is located on an overlapped area of the first and second cylinder member, wherein
the welding step further comprises:
simultaneously applying welding energy onto a first target point and a second target point both located on the circumferential welding path, the second target point being angularly spaced apart from the first target point by an angle of θ degrees, where $80 \leq \theta \leq 100$; and
simultaneously moving both the first and second target points along the circumferential welding path more than one revolution while keeping the angle θ between the first and second target points by relatively rotating the assembly of the first and second cylinder member with respect to a welding machine so that the circumferential welding path is traced at least twice by the welding energy.

27. (New) The method for manufacturing an injector according to claim 26, wherein

the first cylinder member is a valve body having a valve seat portion on which a valve member is able to seat in order to control fuel injection and a cylinder portion in which the valve member is reciprocally accommodated, and

the second cylinder member is a housing having a cylinder portion into which the cylinder portion of the valve body is able to insert.

28. (New) The method for manufacturing an injector according to claim 27, wherein

the welding energy is capable of melting the housing and only outside portion of the valve body located just inside the housing.

29. (New) The method for manufacturing an injector according to claim 26, wherein

the first cylinder member is a housing having a cylinder portion defining a fuel passage, and

the second cylinder member is a magnetic member having a cylinder portion into which the cylinder portion of the housing is able to insert and a portion placed outside a electromagnetic coil for conducting magnetic flux.

30. (New) The method for manufacturing an injector according to claim 26, wherein

the first cylinder member is a valve member having a cylinder portion defining a fuel passage and is able to seat on a seat portion of a valve body in order to control fuel injection, and

the second cylinder member is a movable core having a cylinder portion into which the cylinder portion of the valve member is able to insert.

31. (New) A method for manufacturing an injector, the method comprising the steps of:

providing a first cylinder member having a cylinder portion;
providing a second cylinder member having a cylinder portion into which the cylinder portion of the first cylinder member is able to insert;
inserting the first cylinder member into the second cylinder member to make the cylinder portions overlapped in radial direction; and
welding the second cylinder member and the first cylinder member along a circumferential welding path that forms a closed circle around the second cylinder member and is located on an overlapped area of the first and second cylinder member, wherein
the welding step further comprises:
simultaneously applying welding energy onto "n" target points located on the circumferential welding path, "n" being three or more, the "n" target points being angularly apart from each other by an angle of θ degrees, where $[(360/n) - 10] \leq \theta \leq [(360/n) + 10]$; and
simultaneously moving all of the target points along the circumferential welding path more than one revolution while keeping the angle θ between the target points by relatively rotating the assembly of the first and second cylinder member with respect to a welding machine so that the circumferential welding path is traced at least twice by the welding energy.

32. (New) The method for manufacturing an injector according to claim 31, wherein

the first cylinder member is a valve body having a valve seat portion on which a valve member is able to seat in order to control fuel injection and a cylinder portion in which the valve member is reciprocally accommodated, and

the second cylinder member is a housing having a cylinder portion into which the cylinder portion of the valve body is able to insert.

33. (New) The method for manufacturing an injector according to claim 32, wherein

the welding energy is capable of melting the housing and only outside portion of the valve body located just inside the housing.

34. (New) The method for manufacturing an injector according to claim 31, wherein

the first cylinder member is a housing having a cylinder portion defining a fuel passage, and

the second cylinder member is a magnetic member having a cylinder portion into which the cylinder portion of the housing is able to insert and a portion placed outside a electromagnetic coil for conducting magnetic flux.

35. (New) The method for manufacturing an injector according to claim 31, wherein

the first cylinder member is a valve member having a cylinder portion defining a fuel passage and is able to seat on a seat portion of a valve body in order to control fuel injection, and

the second cylinder member is a movable core having a cylinder portion into which the cylinder portion of the valve member is able to insert.